

1 DR. JACKSON: Thank you. Thank you to the  
2 PCS Task Force for the opportunity to appear here  
3 today and share my thoughts with you.

4 I'm a consultant. I have several clients  
5 in the mobile industry. Studies that I prepared  
6 and co-authored were filed in a PCS proceeding by  
7 Bell Atlantic. Nevertheless, I'm speaking here  
8 today for myself and not for either my firm,  
9 Strategic Policy Research, or any of my clients.  
10 In fact, I think some of my clients disagree with  
11 what I am about to say.

12 MR. STANLEY: We're counting on it.

13 MR. JACKSON: I just assume you suppress  
14 that part of the transcript.

15 I think that there are many important  
16 issues in telecommunications today but there are  
17 few where the FCC is so completely in control.  
18 You know, state regulators can't do anything,  
19 innovation by technologists working on cable  
20 systems can't do anything. The stakes for our  
21 nation are very large in PCS and the FCC is really  
22 in the driver's seat. It's a very important task

1     that you undertake.

2             In the time I have available today, I'm  
3     going to comment briefly on several of the larger  
4     policy issues that were on the list that you were  
5     provided with.

6             But first on the issue of geographic  
7     extent, I think that the Commission has made a  
8     healthy move in picking the relatively large BTAs  
9     and MTAs to define the geographic scope of PCS  
10    license regions. Personally, I don't think the  
11    Commission has gone far enough. I think that the  
12    recent consolidation and in the SMRS industry  
13    illustrates, as did cellular consolidation before  
14    it, that that efficient scale of mobile operations  
15    is more likely to be continentwide than statewide,  
16    and I think you should take that into account,  
17    perhaps all MTA licenses, opportunities for  
18    nationwide licenses and the bidding.

19            The second issue is one that has already  
20    been discussed by the preceding panelists is the  
21    issue of license bandwidth.

22            I believe that the commissions seven-block

1 channel plan for PCS wastes many tens of megahertz  
2 of spectrum and will provide consumers with a far  
3 less competitive market than would many other  
4 channel plans.

5 My own view is with those who support  
6 20 megahertz-wide licenses. I believe that with  
7 the current technology there are significant  
8 reduction in operating costs if a PCS operator has  
9 20 megahertz of spectrum rather than 10. I think  
10 the cost reductions in moving from 20 megahertz to  
11 30 megahertz or less and the cost reductions in  
12 moving from 30 to 40 megahertz are almost nil.

13 And I would suggest that if you find the  
14 case of the advocates for 40 megahertz-wide PCS  
15 licenses persuasive, interesting but ultimately  
16 unproven, then you should put out a channel plan  
17 such as six 20 megahertz licenses which permits  
18 consolidation to 40 megahertz operations inside  
19 the upper and lower PCS sub-bands, should that be  
20 the market choice, and permits multiple operators  
21 for 20 megahertz licenses should that be the  
22 market choice.

1           If there are enormous gains in going from  
2   20 to 40 megahertz, which some allege, then the  
3   auction of the postauction market should reveal  
4   it. But if those gains aren't there, if really 20  
5   is enough but you make available only  
6   40 megahertz blocks, you'll never know you made  
7   the mistake, but consumers will know because  
8   they'll see a less competitive, a less responsive  
9   PCS market.

10           With regard to this split between the upper  
11   and lower band, as you're all aware, the PCS  
12   spectrum was divided into two sub-bands which was  
13   significantly separated. I believe this band  
14   split will have important economic implications  
15   for many years to come. Manufacturers will find  
16   it significantly easier to provide equipment that  
17   operates in the lower band than to provide  
18   equipment which operates in the upper band or  
19   across both bands.

20           Furthermore, I think that developing  
21   products for the lower band will be more  
22   profitable. It's twice as big and has fewer

1 microwave incumbents. So we should expect radio  
2 sales take off faster there. Consequently, I  
3 expect manufacturers to focus first on the lower  
4 band and only later make products available for  
5 the upper band. In the long run, this penalty  
6 will go away but in the short run it does affect  
7 how PCS will develop.

8           With regard to standardization, I think we  
9 can all recognize that some form of common  
10 air-interface would be valuable. It would allow  
11 for the easy provision of roaming service. But  
12 I'm deeply concerned that if the Commission became  
13 involved in the standardization process, consumers  
14 would be harmed and jobs would be lost. Because  
15 of the time limitations, I won't say more than  
16 that.

17           Another issue that was -- on two of the  
18 questions posed for me in preparation of this  
19 session was the possibility of relocating  
20 unlicensed PCS, I guess, above 2130 megahertz. I  
21 think such relocation has the attractive  
22 simplicity, perhaps, of putting all the unlicensed

1 PCS -- the licensed PCS in the low band and  
2 placing all the unlicensed PCS in the high band.  
3 But briefly put I think that such a move would  
4 destroy unlicensed PCS. If you want to destroy  
5 it, just do that and they'll do it through some  
6 cosmetic form that let them linger a low, slow  
7 death over a number of years.

8 I think that unlicensed PCS is very  
9 important to our nation and consumers, and I think  
10 that relocating it would be very unfortunate.

11 One last topic, given the FCC's recent --  
12 that's the impact of the microwave incumbents. I  
13 think given the FCC's recent decision regarding  
14 public safety incumbents, the incumbents no longer  
15 pose a long-run problem for PCS.

16 I also would ask you to observe that, at  
17 least to a first approximation, it doesn't cost  
18 the PCS operator anything to remove the microwave  
19 incumbents. They come out for free. Now, you say  
20 why is that. Well, consider a PCS license region  
21 that has, say, some incumbents that they're going  
22 to take a million dollars to remove, and then once

1 removed, that licenced region will be worth ten  
2 million dollars, and the FCC is going to auction  
3 it off tomorrow. How much are you going to bid?  
4 What's the most you'll bid? Well, it's worth ten  
5 million; it's going to take you a million to get  
6 the incumbents out; you won't bid more than nine  
7 million. If the incumbents went away magically,  
8 you would be willing to bid ten million. If all  
9 bidders see this same common posture in removing  
10 incumbents, which for the first approximation they  
11 probably will do, then they'll all subtract that  
12 cost from the bids and the bids will be lowered by  
13 the amount of the cost of removing the  
14 incumbents.

15 So anybody who tells you not only do we  
16 have to pay for the spectrum, we have to pay for  
17 removing the incumbents, is engaged in a form of  
18 double counting.

19 Thank you.

20 MR. STANLEY: Thank you very much. John  
21 Battin.

22 MR. BATTIN: Thank you. It's a pleasure to

1     be here today. My name is John Battin, and very  
2     simply my job for Motorola is to see that PCS  
3     becomes a very healthy business. I was involved  
4     in cellular at about the same stage of development  
5     and even though I granted it, PCS is much more  
6     complicated than cellular. It didn't seem that  
7     way 15 years ago when we were developing the  
8     cellular business.

9             In our presentation we commented on three  
10    main issues. One, I think that Motorola probably  
11    has more of an opinion on the standard's issue  
12    than most, and I would like to talk to that  
13    briefly.

14            Also, we're very sensitive to the satellite  
15    issue where the current PCS allocation removes 20  
16    megahertz of satellite spectrum that was allocated  
17    at the World Radio Conference. And we're  
18    concerned about that not only because of the 20  
19    megahertz but because of what that might do to the  
20    U.S. credibility of it on an international basis.

21            And then on an overall basis we think that  
22    the microwave clearing issue is sort of



1 underplayed in its importance, and I would like to  
2 make a couple of comments on that.

3 Speaking to microwave -- and this also  
4 plays on the idea of maybe we would move the  
5 unlicensed band and I -- you know, I second that  
6 position; that the 1910 to 1930 band is very  
7 relatively -- it's very clear as compared to the  
8 rest of the PCS spectrum and makes it ideal for  
9 unlicensed.

10 I think in most of our comments we have  
11 leaned pretty heavy on the fact that an  
12 80-megahertz spread between transmit and receive  
13 is very important because that's the way microwave  
14 systems are set up. Further in looking at that we  
15 find that maybe only about 50 percent of current  
16 microwave systems are paired at 50 megahertz. And  
17 also we're -- we look at microwaves and we say,  
18 hey, these are 10 megahertz licenses. When you  
19 look at the equipment, their bandwidth is about 18  
20 megahertz. So when you put that all into the  
21 equation that says there's probably more  
22 flexibility here than we originally thought to do

1 with -- carry between transmit and receive.

2           Since we're fundamentally a manufacturer,  
3 we're really interested in the healthy market,  
4 sell a lot of infrastructure, sell a lot of  
5 subscriber equipment. We don't talk too much  
6 about the size of licenses, et cetera, but I was  
7 pressed to say, hey, what do you really think  
8 about 40, 20s, 30s. And I said, well, I'm just  
9 going to grade these, as if I went away and got  
10 some spectrums, how would I feel about this when I  
11 brought my license back to corporate. And so I  
12 made this chart. And I think one of the more  
13 interesting things about this chart -- and you'll  
14 find that in our filing -- is the massive  
15 difference between the grades before clearing and  
16 after clearing that points out very significantly  
17 that 40 and 30 have a big advantage up front  
18 before the microwave gets cleared. And so I think  
19 the big issue is microwave.

20           MR. STANLEY: Excuse me. Is E the same as  
21 F?

22           MR. BATTIN: Is B the same as what?

1           MR. STANLEY: No, E. You give 10 megahertz  
2 a grade of E.

3           MR. BATTIN: I think with a 10 megahertz  
4 license you have a good chance of coming home with  
5 this big piece of spectrum in use for three or  
6 four years until you get the microwave up.

7           In order to try to explain our position on  
8 standards, I tried to pose it in two different  
9 ways. One would say let's look at it the way  
10 cellular was. There's going to be one standard.  
11 Let's look at it another way, the way that FCC  
12 currently looks at it, that there would be no  
13 standards required, and then show our middle of  
14 the road. And if, in fact, we have one standard,  
15 like we have in cellular, the disadvantages are  
16 that we restrict -- you know, we really restrict  
17 the service diversity. There's a lot of services  
18 planned for PCS that would not be allowed to  
19 happen. We're liable to just see a roll ahead of  
20 current technology, and I don't think the industry  
21 would be able to make a decision. I mean, we  
22 would get locked up between TDMA's and CDMA's and

1 big cells and small cells. You probably -- you  
2 could take -- for sure that would delay the  
3 process.

4 The advantages, of course, is we get  
5 roaming, the users can take their choice of  
6 operators, we get volume manufacturing and the  
7 U.S. would have a standard that we could take  
8 around the world which is an advantage.

9 The current path where the FCC does not  
10 require standards has no assurances are going to  
11 be in the interoperability. It means that  
12 probably -- you may not have roaming from system  
13 to system. There's a potential that a subscriber  
14 may sign up with a system that doesn't exist in  
15 the future so that a group of subscriber units  
16 could be made obsolete by an operator going out of  
17 business and abandoning them. That tends to  
18 defuse our efforts internationally to be a trend  
19 setter.

20 It's far more complex to work out microwave  
21 sharing where, in fact, there is multiple kinds of  
22 technologies that you're working with because

1 different technologies interfere were microwave in  
2 different ways. And, of course, there's  
3 confusion.

4 Of course the advantage of those standards  
5 is that there's the ultimate in flexibility and,  
6 of course, you get fast in the market.

7 And I see my light came on so I'm going to  
8 go --

9 MR. STANLEY: I think you have another  
10 minute.

11 MR. BATTIN: What we are proposing is that  
12 the FCC not get into the standards process any  
13 more than to say that all protocols -- I lost out  
14 on my last --

15 MR. STANLEY: That's okay. Please complete  
16 your thought about the standards.

17 MR. BATTIN: Our position is that the way  
18 we're currently -- the way we're currently going  
19 with no required standards, for sure there's going  
20 to be a lot of flexibility, but our position that  
21 the FCC should require at least systems that go on  
22 the air to operate with standards are really going

1 to promote multiple vendors with high volumes and  
2 competitive products. We're going to minimize the  
3 varieties of products. Whereas without standards,  
4 there may not just be TDMA's and CDMA's; there may  
5 be a Qualcomm version of CDMA, a Motorola version,  
6 an AT&T version, an Erickson version. It will  
7 establish credibility of our systems on a  
8 worldwide basis, and we think it's going to speed  
9 the standardization process because we can take --  
10 and the way it's happening now is that the various  
11 systems will set up into groups with -- you know,  
12 with the charter to make standards on each one of  
13 these technologies that the industry requires.

14 Thank you.

15 MR. STANLEY: Thank you very much.  
16 Dr. Jacobs, please.

17 DR. JACOBS: Good morning. My name is  
18 Irwin Jacobs. I'm chairman and chief executive  
19 officer of Qualcomm. I would like to thank the  
20 Commission for giving me this opportunity to  
21 participate on the panel of discussion of the  
22 PCS's spectrum technical issues.

1           I'll focus my initial comments on technical  
2 issues including system capacity, service quality,  
3 cost implications and standards.

4           As the Commission is aware, Qualcomm has  
5 developed a complete digital PCS system allowing a  
6 single technology portable phone to deliver a full  
7 range of PCS services equally well and large macro  
8 cells with high speed handsoff and also  
9 distributed in-building microcells with dense  
10 usage and heavy frequency reuse.

11           The system is based on Qualcomm's work in  
12 the application of code division multiple access,  
13 CDMA, technology to the mobile communications  
14 channel.

15           The fundamental concept of a CDMA system is  
16 that all users of a communications channel use  
17 common spectrum at the same time with  
18 channelization provided by the assignment of a  
19 unique code to each user. In our system we  
20 divided the channels into one-and-a-quarter  
21 megahertz and have extensions to two-and-a-half  
22 megahertz and 5 megahertz-wide signals.

1           The receiver applies advance digital signal  
2   processing techniques to separate the desired  
3   users from others being simultaneously received.  
4   The use of a common frequency by a large number of  
5   users allows all cells in a multicell system to  
6   share the same slice of spectrum.

7           Other technical features of the CDMA  
8   system, some of which are unique to CDMA, support  
9   demonstrated capacity gains of 10 to 20 times that  
10   of the existing analog cellular systems. Qualcomm  
11   has demonstrated such capacity in extensive  
12   testing of its PCS system that is carried out now  
13   over the past several years.

14           It should be noted that the existing  
15   cellular systems service perhaps 6 percent of the  
16   United States population, and that the CDMA  
17   capacity improvement would support an increase to  
18   nearly 100 percent of the population without  
19   additional spectrum but at the current level of  
20   usage. However, with the new PCS services and the  
21   enhanced competitive environment fostered by the  
22   auction of additional spectrum, one can expect



1 usage to go up and approach or exceed, perhaps,  
2 that of the wired access network.

3 To maximize system capacity, the Qualcomm  
4 PCS system uses precise closed loop power control,  
5 which causes each mobile to transmit the minimum  
6 power at each instant required to provide a  
7 desired quality of service. This feature  
8 increases mobile talktime, facilitates spectrum  
9 sharing and reduces safety and EMI concerns. It  
10 also operates with a lower radiated power from  
11 base stations such that a limit such as that  
12 proposed by the Commission is feasible except that  
13 it should be modified to specify a power density  
14 scaling the effective power radiated from an  
15 antenna to signal bandwidths or to the number of  
16 users.

17 Let me now address some of the specific  
18 questions raised by the FCC. First, the size of  
19 the section block. As noted above, Qualcomm has  
20 demonstrated that its system provides ten times  
21 greater the capacity of AMPS. This means that a  
22 20 megahertz block, which is 80 percent of the

1 existing 800 megahertz cellular authorization,  
2 could provide more than eight times the capacity  
3 of a current cellular system.

4 Similarly, a 10 megahertz allocation will  
5 support more than 4 times the capacity of an  
6 existing cellular system, assuming the same number  
7 of base stations and 3-sectored cells and  
8 compatible adjacent systems.

9 The capacity could further be increased by  
10 increasing the number of sectors and/or reducing  
11 the average vocoder rate. This, of course,  
12 assumes clear spectrum. The number of existing  
13 microwave users, incidentally, can limit the  
14 capacity in the short term. For these reasons I  
15 believe that a PCS licensing could use any of the  
16 proposed block sizes -- 10, 20, 30 or even 40  
17 megahertz -- to provide a viable PCS service. The  
18 Commission, therefore, must look to other  
19 nontechnical issues such as the number of  
20 competitors and the need to provide spectrum for  
21 designated entities to determine the block size.

22 I also believe that any of the proposed

1 block sizes could be used to support a highly  
2 attractive set of new digital data services to  
3 meet anticipated market demand, although a 10  
4 megahertz licensee certainly would have less  
5 flexibility in meeting such market demands.

6           Regarding the road of usefulness of the  
7 upper and lower bands, although Qualcomm has not  
8 yet produced equipment in the upper bands, there  
9 is no technical impediment if there is sufficient  
10 demand for such equipment and, therefore, for  
11 quantities of required new RF components.

12           Our system which uses a 1.25 megahertz  
13 bandwidth with extensions to 5 is compatible with  
14 a 10 megahertz and larger allocations. We are  
15 pursuing dual mode/dual band equipment that will  
16 operate in both the 800 megahertz cellular band  
17 and one or both PCS bands. However, the dual 1.8  
18 and 2.1 equipment; that is the one covering both  
19 the lower and the upper PCS bands, that would  
20 result in we estimate now about a 20 to 25 percent  
21 increase in cost and weight over 1.8 megahertz  
22 only. And, in fact, the dual mode -- dual

1 frequency band AMPS and 1.8 would only be,  
2 perhaps, a 15 to 20 percent increase; a little bit  
3 less expensive.

4 I'll conclude my remarks with a few  
5 observations on standards.

6 I believe the Commission does have a role  
7 to play in the process. It should not, however,  
8 set standards. It should ensure that the  
9 equipment used to provide service conforms to an  
10 industry approved standard. It can do this by,  
11 for example, requiring as a condition for type  
12 acceptance that all mobile and base station  
13 equipment conform to a standard issued by an  
14 ANSI-approved standards setting organization such  
15 as the Telecommunications Industry Association.  
16 Such an action by the Commission would allow the  
17 industry to develop multiple standards and would  
18 encourage equipment vendors to develop conforming  
19 equipment.

20 Thank you very much.

21 MR. HALLER: Dr. Nagel, please continue.

22 DR. NAGEL: Thank you. I appreciate the

1 opportunity to appear before the PCS Tack Force  
2 today.

3           The PCS is a new technology that will  
4 enable users of personal computers to communicate  
5 data of high rates among groups people of over  
6 distances of up to 50 meters without wires or  
7 other fixed connections.

8           There is no technology or service available  
9 that today provides the benefits of Data-PCS to  
10 students, educators, researchers, workers, health  
11 care professionals, scientists and others.

12           At present, however, Commission's PCS rules  
13 fail as yet to provide for the deployment of  
14 Data-PCS. I would like, therefore, to address the  
15 additional steps that must be taken to make  
16 Data-PCS a reality.

17           The Commission should recognize two basic  
18 differences between most unlicensed voice PCS and  
19 most unlicensed Data-PCS. Data-PCS is the only  
20 emerging PCS proposed unlicensed voice services  
21 such as wireless PBXs, are primarily modifications  
22 to or extension of existing and planned voice

1 services such as cordless residential phones,  
2 cellular telephones and licensed PCS systems or  
3 current wire services. They provide few new  
4 benefits to the public other than convenience.

5 In contrast Data-PCS is not a modification  
6 of an existing service. Data-PCS, for example,  
7 would be the primary, and in some cases the only  
8 practical means of providing Internet access  
9 throughout schools; the only practical means to  
10 enable doctors to connect to medical resources in  
11 hospitals, to allow persons attending meetings to  
12 benefit from a copious and immediate exchange of  
13 information. These and other important needs  
14 could not otherwise be met unless frequencies are  
15 made available specifically for Data-PCS.

16 Most unlicensed voice products including  
17 all wireless PBXs will operate in conjunction with  
18 a fixed base station. As a result they can be  
19 frequency coordinated; that is they could be  
20 deployed at specific sites or even in a particular  
21 metropolitan area starting right now without the  
22 need for the spectrum to be cleared of microwave

1 waive incumbents.

2           In contrast, Data-PCS services are  
3 nomadic. They are not tied to any fixed base  
4 stations. The users will take them wherever they  
5 need to exchange or access information. Moreover,  
6 users will not know in advance when or where  
7 they'll use the device and they can not be limited  
8 to operating in a predetermined clear site.  
9 Anything less than anytime, anywhere  
10 communications simply does not recognize the  
11 reality of the Data-PCS customers' requirements.

12           Data-PCS devices can not be frequency  
13 coordinated. To deploy even the very first  
14 Data-PCS-equipped laptop or personal digital  
15 assistant, we have to remove the last microwave  
16 link, both the co-channel and the adjacent channel  
17 from harm's way, which we call the last link  
18 problem.

19           If Data-PCS is to become a reality, the  
20 Commission must correct two problems, which  
21 together increase the delay and uncertainty  
22 associated with the band clearing process, and

1     thus may make it impossible to raise the capital  
2     necessary to clear the unlicensed data band.

3             First, in an effort to impose equal pain on  
4     voice and data services, the Commission gave only  
5     a half of the relatively lightly loaded 1910 to  
6     1930 megahertz band to each of the two unlicensed  
7     applications-isochronous and asynchronous devices  
8     or in other words, devices that generally can be  
9     frequency coordinated and those that cannot.

10            This decision is fair only as both data and  
11     voice services have an equal opportunity to occupy  
12     their respective bands. They do not.

13            While most voice services can begin  
14     operations by applying frequency coordination and  
15     postpone or avoid relocating microwave incumbents,  
16     Data-PCS faces the link problem and cannot deploy  
17     without band clearing.

18            For the voice services it's a difference  
19     that can be measured in some additional dollars  
20     and must be sent to deploy, but for the  
21     nomadicated services it's the difference between  
22     being online and not being online.



1           The present allocation does not provide  
2   sufficient usable bandwidth for Data-PCS even if  
3   we were to incur the cost of delay of band  
4   clearing. The problem with the current allocation  
5   is especially severe when one considers the  
6   problem of adjacent-channel microwave stations  
7   which in reality must be treated as co-channel or  
8   be modified in order to avoid interference to  
9   them.

10           Due to the large number of microwave links  
11   in the 1900 to 1910 megahertz sub-band, it is cost  
12   effective to clear only the more lightly loaded  
13   line 1910 to 1920 megahertz portion of data  
14   sub-band, at least initially, before we can  
15   finance further band clearing out of the sale of  
16   Data-PCS devices. Even if the sub-band were  
17   cleared, however, it would be squeezed between a  
18   heavily loaded microwave band on one side, the  
19   1900 to 1910 band, and an unlicensed voice band on  
20   the other side, whose attended occupants have no  
21   motivation to clear the last link because wireless  
22   PBXs cannot operate through frequency